

Consumption, money, and excess returns

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Consumption, Money, and Excess Returns

Maik Schmeling*

This draft: October, 2007

Abstract:

We augment the standard CCAPM by the growth in money holdings and empirically investigate whether money is helpful for pricing a cross-section of U.S. excess returns. We find that the growth in M2 significantly improves the fit of the CCAPM with R^2 s well above 80 percent in a cross-section with the three Fama-French factors, the momentum portfolio, a contrarian portfolio, and two bond portfolios as test assets.

JEL-Classification: G10, G12, E44

Keywords: Asset pricing; CCAPM; Liquidity; Momentum; Money-in-the-utility-function

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Consumption, Money, and Excess Returns

1. Introduction

Standard macro asset pricing models fall short of adequately explaining the cross-section of asset returns, a point recently reinforced by Lewellen, Shanken and Nagel (2006). In order to improve the empirical performance of these models, we consider money as a possible determinant of asset returns. We find that two factors, consumption growth and the growth in M2, do a good job in explaining the cross-section of the three Fama-French risk factors (Fama and French, 1996), the excess returns to momentum (Jegadeesh and Titman, 2001) and contrarian (DeBondt and Thaler, 1985) strategies, as well as the spread in Baa and AAA rated bonds and the term premium of long and short term bonds. Cross-sectional R^2 s are well above 0.8.

Recent research indicates that, from a macro perspective, money should play a role in asset pricing. Pastor and Stambaugh (2003) find in a microstructure setting that stock market liquidity is a determinant of stock returns. From a macroeconomic perspective, money balances should be correlated with aggregate stock market liquidity so that aggregate money holdings should matter for asset prices. Furthermore, Romer and Romer (2004) convincingly demonstrate that monetary policy has real effects on macroeconomic activity which also suggests a potential role for money in asset pricing models. Apart from the empirical findings, money arises naturally in an asset pricing framework when consumers have money in their utility function (see e.g. Devereux and Engel, 2003).

Surprisingly, there has been little research on the effect of money on the cross-section of stock returns. Although early papers have investigated the effect of monetary factors on the aggregate market (e.g. Chen, Ross, and Roll, 1986, and Finn, Hoffman, and Schlagenhauf, 1990), money is a "missing ingredient" in recent models of asset prices which emphasize the cross-section of returns (Cochrane, 2006, p. 76). This paper investigates the importance of this missing ingredient for a cross-section of U.S. excess returns.

We proceed as follows: section 2 describes the methodology, section 3 presents the data used in the empirical application, section 4 shows estimation results, and section 5 concludes.

2. Methodology

We assume a representative consumer who maximizes utility both over end-of-period real per capita consumption (c) and beginning-of-period real per capita money holdings (m). One way to think about why money emerges as an argument in the utility function is because real money balances allow agents to save time in conducting their transactions. Therefore, since agents value leisure, money enters indirectly in the utility function because it lowers "shoe-leather" costs (see e.g. Devereux and Engel, 2003).

Different specifications of this utility function imply different pricing kernels in a standard stochastic discount factor (SDF) approach. We make use of the fact that every pricing kernel s_{t+1} can be linearized (see Lettau and Ludvigson, 2001) and work with the following approximation which proxies for a variety of different utility specifications:

$$s_{t+1} \approx \beta_0 + \beta_1 \Delta c_{t+1} + \beta_2 \Delta m_{t+1} \quad (1)$$

where Δc and Δm denote log growth rates of the respective variables.¹

Since we will deal with excess returns $R^{i,e}$ of different test assets i in the empirical application below, the standard pricing equation (Cochrane, 2004) is

$$\mathbb{E} [s_{t+1} R_{t+1}^{i,e}] = 0 \quad (2)$$

which intuitively says that excess returns $R^{i,e}$ (returns of zero-cost portfolios) discounted by the pricing kernel s must have price zero. Equation (2) yields as many moment conditions in an GMM estimation procedure as there are test assets i . Since β_0 in (1) is not identified in this pricing equation, we normalize the constant to unity, demean the two factors and work with

$$s_{t+1} = 1 + \beta_1 \Delta \tilde{c}_{t+1} + \beta_2 \Delta \tilde{m}_{t+1} \quad (3)$$

where $\Delta \tilde{c}_{t+1} \equiv \Delta c_{t+1} - \mathbb{E}(\Delta c_{t+1})$ and $\Delta \tilde{m}_{t+1}$ is defined analogously.

¹For example, with a conventional utility function defined over consumption and money balances of the following form $U(c_{t+1}, m_{t+1}) = (c_{t+1}^\alpha m_{t+1}^\eta)^{1-\gamma} / (1-\gamma)$ the associated pricing kernel $s_{t+1} \equiv \beta U_{c_{t+1}} / U_{c_t}$ is $s_{t+1} = \beta \hat{c}_{t+1}^{\alpha(1-\gamma)-1} \hat{m}_{t+1}^{\eta(1-\gamma)}$ where β is the subjective discount factor and \hat{c} and \hat{m} are growth rates. This kernel can be linearized to yield (1).

Applying a covariance decomposition to (2), it can be shown (Cochrane, 2004) that the expected excess return for any portfolio is given by

$$\mathbb{E}(R_{t+1}^{i,e}) = -\frac{\mathbb{CV}[s_{t+1}, R_{t+1}^{i,e}]}{\mathbb{E}[s_{t+1}]} \quad (4)$$

where \mathbb{CV} denotes covariance. Portfolios with higher excess returns must have a lower correlation with the pricing kernel. Intuitively, the pricing kernel is high in "bad times" and low in "good times". Asset returns that are negatively correlated with the pricing kernel yield low returns when times are bad. This makes these assets more risky and thus command a return premium. We will use (4) to calculate model implied expected returns in the empirical analysis below.

Finally, we have to choose test assets on which the above model is to be estimated and evaluated. Several recent papers criticize the use of the standard 25 Fama-French portfolios as test assets since these portfolios essentially have 3 degrees of freedom only, namely the three Fama-French risk factors (see Lewellen, Nagel and Shanken, 2006). Cochrane (2006) concludes that "[...] it would be better for macro models to focus on pricing the three Fama-French factors rather than the highly cross-correlated 25 portfolios, which really add no more credible information" (Cochrane, 2006, p. 51). We focus on these three factors and also test our model on an augmented set of excess returns which are ubiquitous in the asset pricing literature and are detailed in the next section.

3. Data

We employ quarterly data from 1959 Q3 to 2006 Q4 on real per capita non-durable goods and services consumption (c) and real per capita money holdings (m). Nominal money holdings are proxied for by M2. Consumption data come from the Bureau of Economic Analysis (Table 7.1) and M2 data from the Fed St. Louis. All data is CPI deflated.

We also make use of five stock portfolios as test assets, namely the market excess return (in excess of the risk-free rate, MKTRF), the HML factor, the SMB factor, a momentum portfolio long in past winner and short in past loser stocks over the last twelve months (MOM),

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and a contrarian portfolio long in past losers and short in past winners over the last five years (long-term reversal, LTR). These stock market data come from the web site of Prof. Kenneth French and are chained into quarterly returns. While the first three portfolios (MKTRF, HML, SMB) are the three Fama-French risk factors whose return spread is yet to be explained by a macro model, the latter two portfolios are chosen to test our model on two widely studied return anomalies, i.e. the abnormal returns to momentum (Jegadeesh and Titman, 2001) and contrarian strategies (DeBondt and Thaler, 1985).

Furthermore, we use as test assets a portfolio long in corporate bonds rated Baa and short in bonds rated AAA (Baa-AAA) and a portfolio long in bonds with 10 year maturities and short in bonds with one year maturities. These two portfolios are chosen to assess whether our model also prices excess returns from the bond market.²

Table 1 shows descriptive statistics for consumption and money growth and the seven test assets over the sample of 190 quarters. As is evident, all seven portfolios have positive mean returns though they are cost-free and thus have to load on some sort of risk factor. Also shown in the last two columns are the correlation coefficients of each time series with consumption growth (ρ, \hat{c}) and money growth (ρ, \hat{m}) .

INSERT TABLE 1 ABOUT HERE

Note that M2 growth is much more volatile than consumption growth. Also, consumption growth and money growth are positively correlated. The higher volatility of M2 growth and the positive correlation with consumption growth implies a higher volatility of the pricing kernel and may thus help to ease the equity premium puzzle (Mehra and Prescott, 1985).

4. Empirical results

We estimate the key pricing equation (2) via GMM with different sets of test assets. Since we are using at least three assets but estimate only two parameters, β_1 and β_2 , we can

²By construction, all of these portfolios deliver excess returns and have price zero since the long position is financed by the short position.

also use a *J-test* to assess the validity of the overidentifying restriction(s) (see Cochrane, 2004). Results of this estimation procedure are detailed in Table 2 which reports both first-stage estimates in the upper panel and iterated estimates in the middle panel. The lower panel indicates which test assets are included in the estimation.

INSERT TABLE 2 ABOUT HERE

The first specification (I) estimates (3) only on the three Fama-French factor-mimicking portfolios. Both consumption growth and M2 growth enter correctly with a negative sign. Therefore, a lower growth of money balances increases the pricing kernel and indicates bad times for investors. This makes sense, since lower money balances imply higher "shoe-leather" costs. The same result is obtained when we include the momentum portfolio (II), the contrarian portfolio (III), or both of these portfolios (IV). The *J-tests* do not reject the model. Finally, specification (V) also includes the two zero-cost bond portfolios which has little effect on the estimated coefficients and the *J-test*.

It has become increasingly common in the asset pricing literature to evaluate a model's performance by comparing actual returns with fitted returns implied by the model (Lettau and Ludvigson, 2001). We plot realized quarterly mean returns vs. fitted returns in Figure 1 for specifications (I), (II), (IV), and (V) of Table 2. At the top of each figure we also show the cross-sectional R^2 as indication of model fit. Fitted returns are calculated according to equation (4).

INSERT FIGURE 1 ABOUT HERE

As can be seen, the CCAPM augmented by growth in money balances does a good job in matching realized mean returns over the last 40 years. This is true for specification (I) which is estimated only on the three Fama-French factor-mimicking portfolios and for the other specifications with more test assets. Cross-sectional R^2 s are well above 80 percent. Even the notoriously difficult-to-price momentum portfolio lines up well with actual returns.³ This

³See Menkhoff and Schmeling (2006) for a behavioral approach to explain momentum returns.

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confirms findings in Pastor and Stambaugh (2003) who report that liquidity is an important determinant of momentum returns. Money growth should be correlated with the liquidity factor in Pastor and Stambaugh (2003) so that the result seems reasonable.

5. Conclusion

We have investigated a simple extension to the CCAPM which adds growth in M2 to the pricing kernel. According to recent evidence by Cochrane (2006) and Lewellen, Nagel and Shanken (2006) we focus on pricing the Fama-French factor-mimicking portfolios and further zero-cost portfolios that are ubiquitous in the asset pricing literature but more or less refused to obey a rational pricing story so far.

The results indicate that monetary factors seem to be important for the cross-section of asset returns, and that the inclusion of these factors into other asset pricing models might be fruitful for future research.

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Table 1. Descriptive statistics

	mean	std	$\rho_{\cdot,\hat{c}}$	$\rho_{\cdot,\hat{m}}$
Δc	0.55	0.44		0.20
Δm	1.40	0.91	0.20	
MKTRF	1.45	8.56	0.16	-0.08
HML	1.51	5.90	-0.02	0.06
SMB	0.59	5.79	0.12	-0.06
MOM	4.17	10.97	0.02	0.10
LTR	1.47	10.37	0.06	0.02
Baa-AAA	0.98	0.82	-0.14	0.33
10Y-1Y	0.84	1.62	0.13	-0.08

Notes: Columns "mean" and "std" report the quarterly mean and standard deviation, respectively. The last two columns show the correlation coefficient of a variable with consumption growth ($\rho_{\cdot,\hat{c}}$) and M2 growth ($\rho_{\cdot,\hat{m}}$).

Table 2. Estimation results

	(I)	(II)	(III)	(IV)	(V)
First stage estimates					
$\Delta\tilde{c}$	-0.72 (0.40)	-0.53 (0.21)	-0.45 (0.38)	-0.48 (0.21)	-0.49 (0.21)
$\Delta\tilde{m}$	-0.50 (0.55)	-0.31 (0.24)	-0.26 (0.59)	-0.29 (0.22)	-0.30 (0.22)
J-stat	0.02 (0.89)	0.20 (0.91)	0.53 (0.77)	0.61 (0.89)	3.19 (0.67)
Iterated estimates					
$\Delta\tilde{c}$	-0.73 (0.40)	-0.56 (0.17)	-0.60 (0.20)	-0.54 (0.16)	-0.50 (0.19)
$\Delta\tilde{m}$	-0.51 (0.54)	-0.31 (0.23)	-0.36 (0.41)	-0.33 (0.24)	-0.38 (0.06)
J-stat	0.02 (0.90)	0.20 (0.91)	0.53 (0.77)	0.61 (0.89)	3.19 (0.67)
Test Assets					
MKTRF	YES	YES	YES	YES	YES
HML	YES	YES	YES	YES	YES
SMB	YES	YES	YES	YES	YES
MOM	NO	YES	NO	YES	YES
LTR	NO	NO	YES	YES	YES
BAA-AAA	NO	NO	NO	NO	YES
Bond Portfolio	NO	NO	NO	NO	YES

Notes: This table shows GMM estimation results from first stage (upper panel) and iterated estimates (middle panel). The lower panel shows which test assets are included in the estimation.

Figure 1. Model fit

